



Peaceful Use of Nuclear Energy and Efforts to Ensure its Compatibility with Nuclear Non- Proliferation

Toshio OKAZAKI

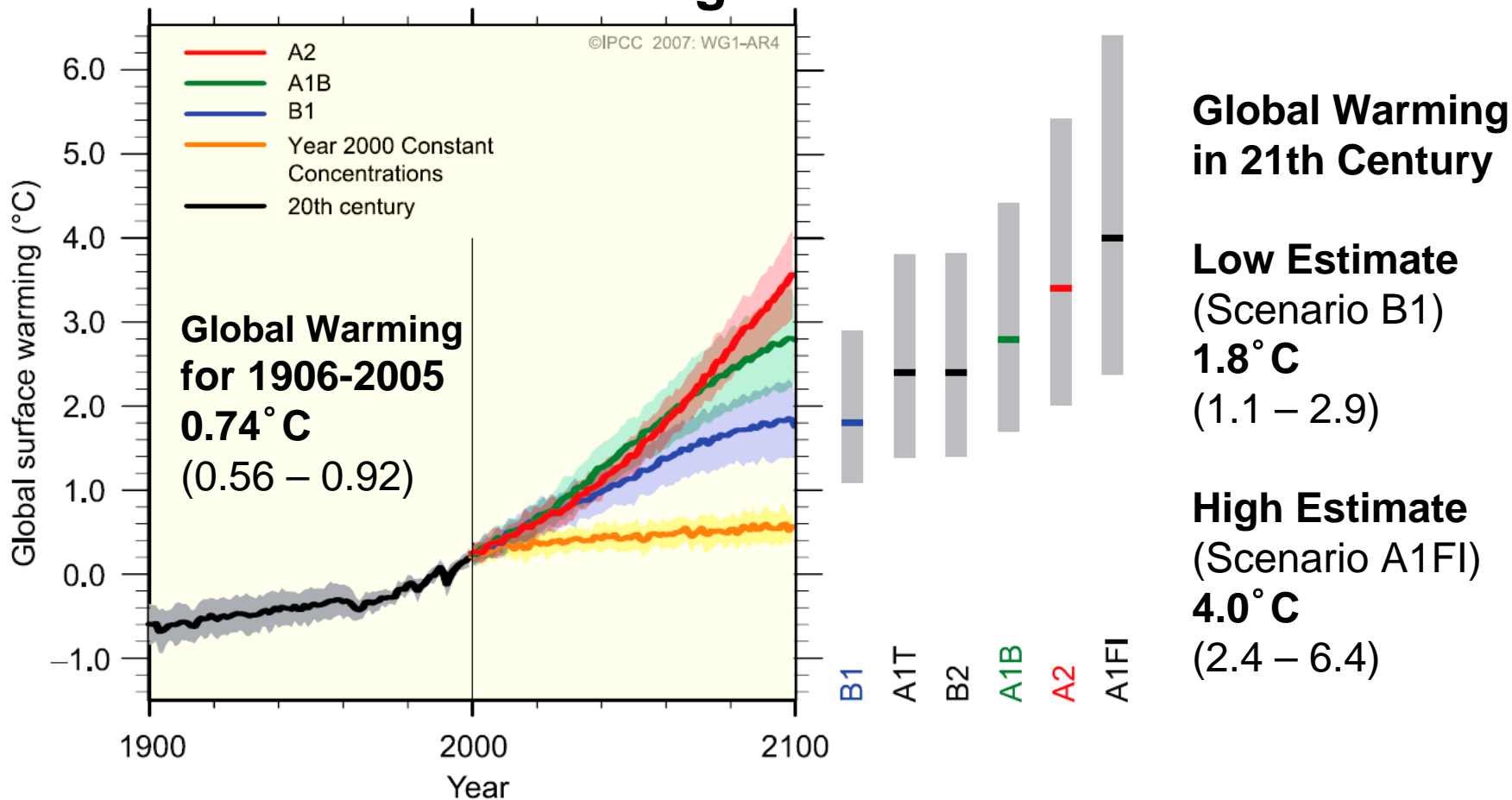
President
Japan Atomic Energy Agency

Outline

- I Overview of Global Trends in the Peaceful Use of Nuclear Energy**
- II Status of Nuclear Energy Use in Japan**
- III Japan's Efforts to Ensure Compatibility between Peaceful Nuclear Energy Use and Nuclear Non-Proliferation**
- IV Responsibilities of States which pursue Nuclear Energy Option and Japan's Contribution**
- V Concluding Remarks**

I Overview of Global Trends in the Peaceful Use of Nuclear Energy

Global Surface Warming for Different Scenarios



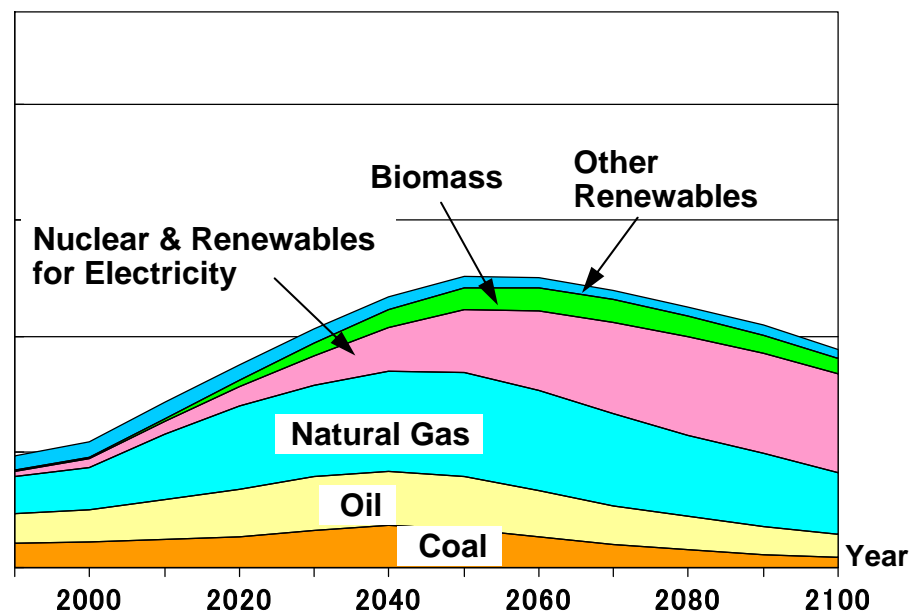
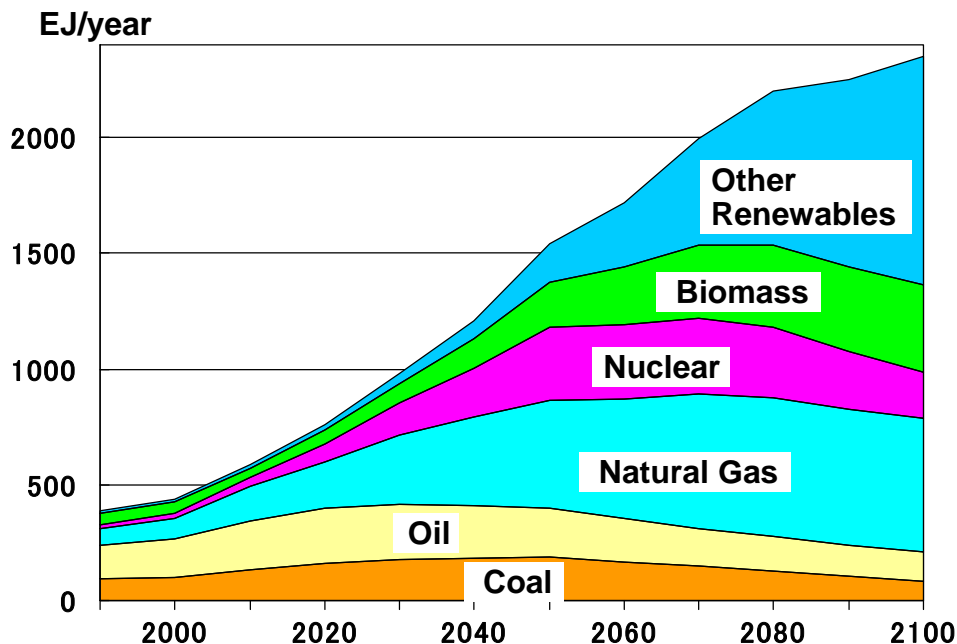
Source: Climate Change 2007: The Physical A report of Working Group I of the Intergovernmental Panel on Climate Change, Summary for Policy Makers

Our Futures have Diversity

Examples of Long-term Primary Energy Consumption (IPCC)

Society with High Economic Growth (A1)

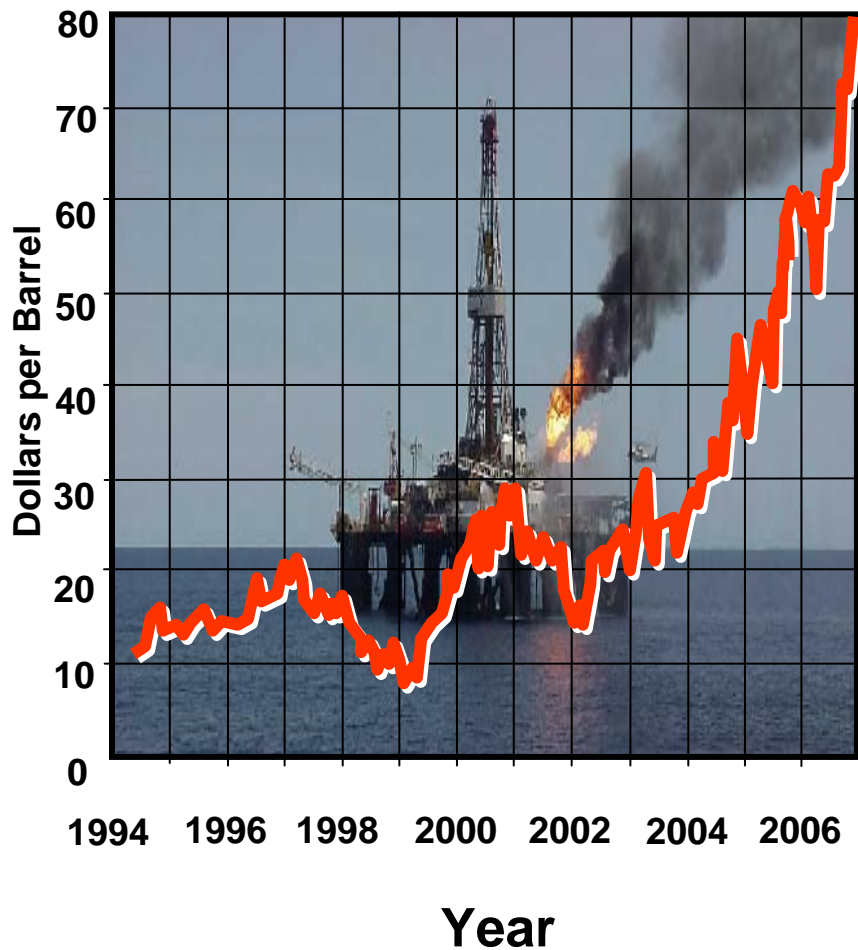
Society with Sustainable Development (B1)



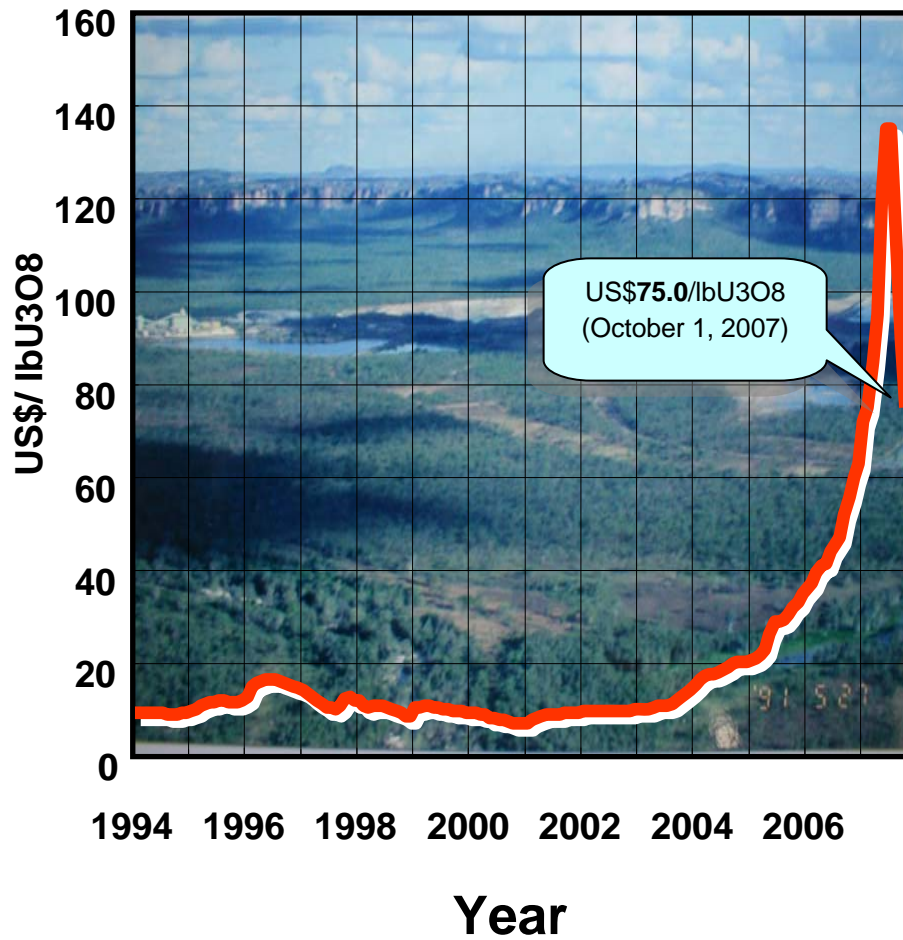
Data Source: Nebojsa Nakicenovic and Rob Swart (editors), IPCC Special Report on Emissions Scenarios, IPCC Web site (<http://www.grida.no/climate/ipcc/emission/index.htm>)

Transition of Oil and Uranium Price

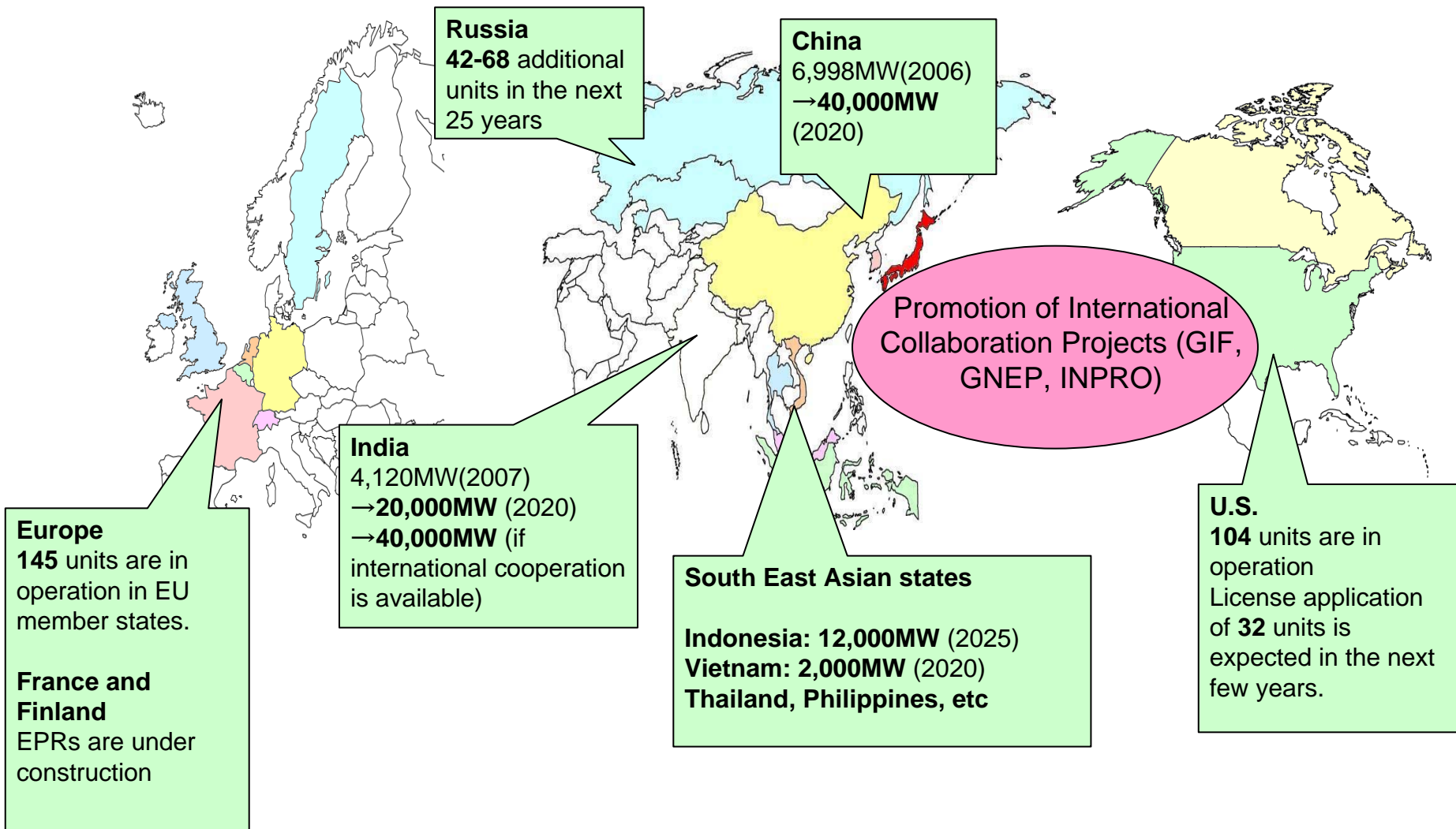
Oil



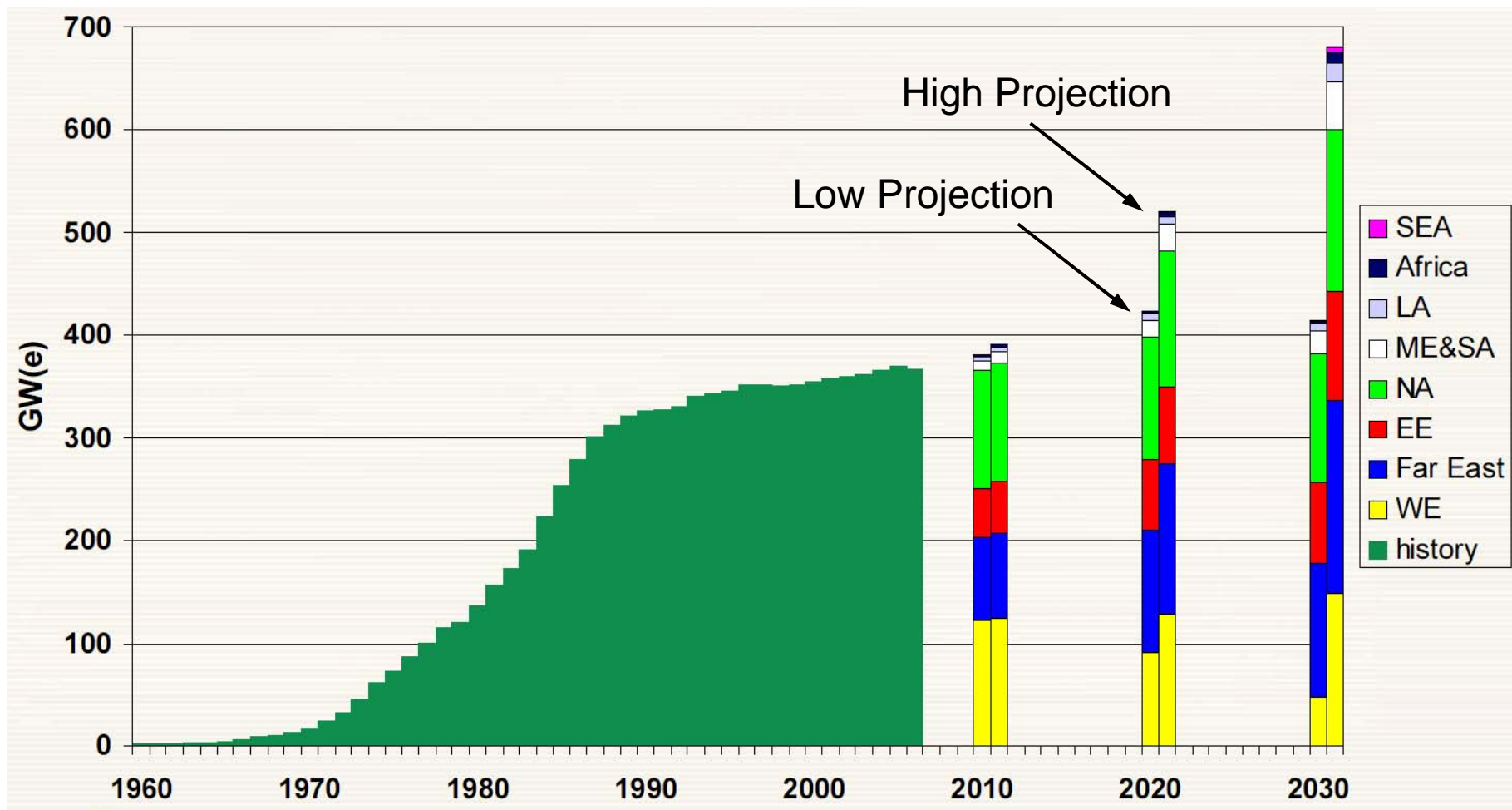
Uranium



Recent Global Developments in the Peaceful Use of Nuclear Energy



Historical Growth and Future Projections



Source: A. McDonald (IAEA): Nuclear Power: Status and Outlook, CSD-15, New York, USA, 7 May 2007.

International Symposium Nuclear Nonproliferation and Peaceful Use of Nuclear Energy (JAEA Symposium/JIIA Forum), Tokyo, 2007

➤ Restructuring of Nuclear Industry

✓ Toshiba-Westinghouse
✓ GE-Hitachi
✓ ATMEA (AREVA- Mitsubishi)

} Global alliances

✓ Atomenergoprom

Russian state enterprise

➤ Increased leverage of uranium-rich countries (Australia, Canada, Kazakhstan)

✓ Interest in uranium enrichment (Australia, Canada)

✓ Pursuit of active policy of uranium export

(Australia-India, Australia-China, Kazakhstan-Japan)

Multilateral Collaboration



Generation-IV International Forum (GIF)

Members: 12 countries and EURATOM

Jan. 2000 – GIF was established

Feb. 2005 – Framework Agreement



Global Nuclear Energy Partnership (GNEP)

Partners:

US, China, France, Japan, Russia, Australia, Bulgaria, Ghana, Hungary, Jordan, Kazakhstan, Lithuania, Poland, Romania, Slovenia and Ukraine



International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)

Members: 27 countries and European Commission

September 2000 – INPRO was initiated

II Status of Nuclear Energy Use in Japan

Japan's Nuclear Policy

*Japan is the only nation in the world
bombed with nuclear weapons*

➤ **Atomic Energy Basic Law**

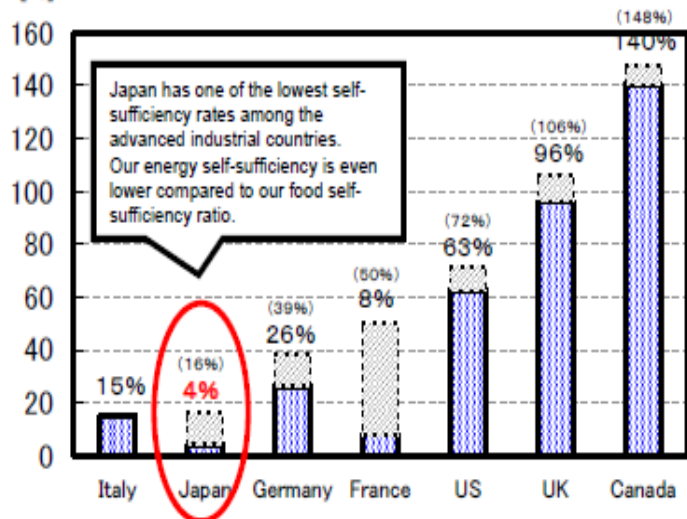
Research, development and use of nuclear energy should be restricted only to peaceful purposes and should be conducted in fully democratic operations.

➤ **United Nations General Assembly resolution on disarmament**

Japan has submitted the resolutions on disarmament every year since 1994 to the General Assembly of the United Nations with a view to achieving a peaceful and safe world free of nuclear weapons.

Background of Japan's Nuclear Energy Policy

[%] Energy Self-Sufficiency of Major Countries <2003>



“Energy self-sufficiency rate is 4 %”

* The self-sufficiency ratio figures are based on the assumption that nuclear power is imported (figures in parentheses are based on the assumption that nuclear power is domestically produced).

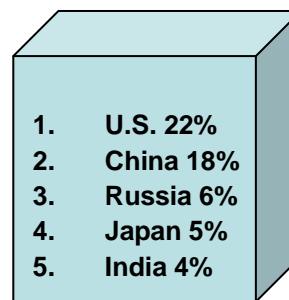
Source: Energy Balances of OECD Countries 2002-2003, IEA

“Invitation to Cool Earth 50”

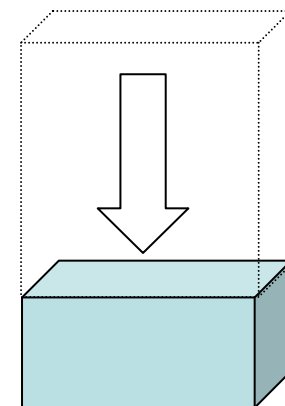
Japanese Initiative to address the issue of climate change

Three proposals

- Halving emissions by 2050 (Long-Term Strategy)
- Three principles in designing concrete framework beyond 2013 (Mid-Term Strategy)
 - ① Participation of all Major emitters, ② Flexibility and Diversity,
 - ③ Compatibility between environmental protection and economic growth
- National Campaign for achieving Japan's Kyoto protocol Target



Current Emissions



Year 2050

Framework for Nuclear Energy Policy

*Framework for Japan's Nuclear Energy Policy
was (adopted in October 2005 by the Cabinet)*

■ Basic Targets

- (a) Continue to meet **at least 30 to 40% of electricity** supply even after 2030 by nuclear power generation,
- (b) **Promote the nuclear fuel cycle**, and
- (c) Aim at commercialization of **FBR by 2050**.

Japan's Current Nuclear Energy Development

- Japan is the only non-nuclear weapon state with commercial-scale closed nuclear fuel cycle program.*



Rokkasho Enrichment Plant (JNFL)

March 1992: Start of the operation



Rokkasho Reprocessing Plant (JNFL)

under final commissioning test
Start of the operation is expected in February 2008

Tokai Plutonium Fuel Center (JAEA)



**Light-water reactor 55 Units
(49.58GWe)**



Prototype FBR "MONJU" (JAEA)

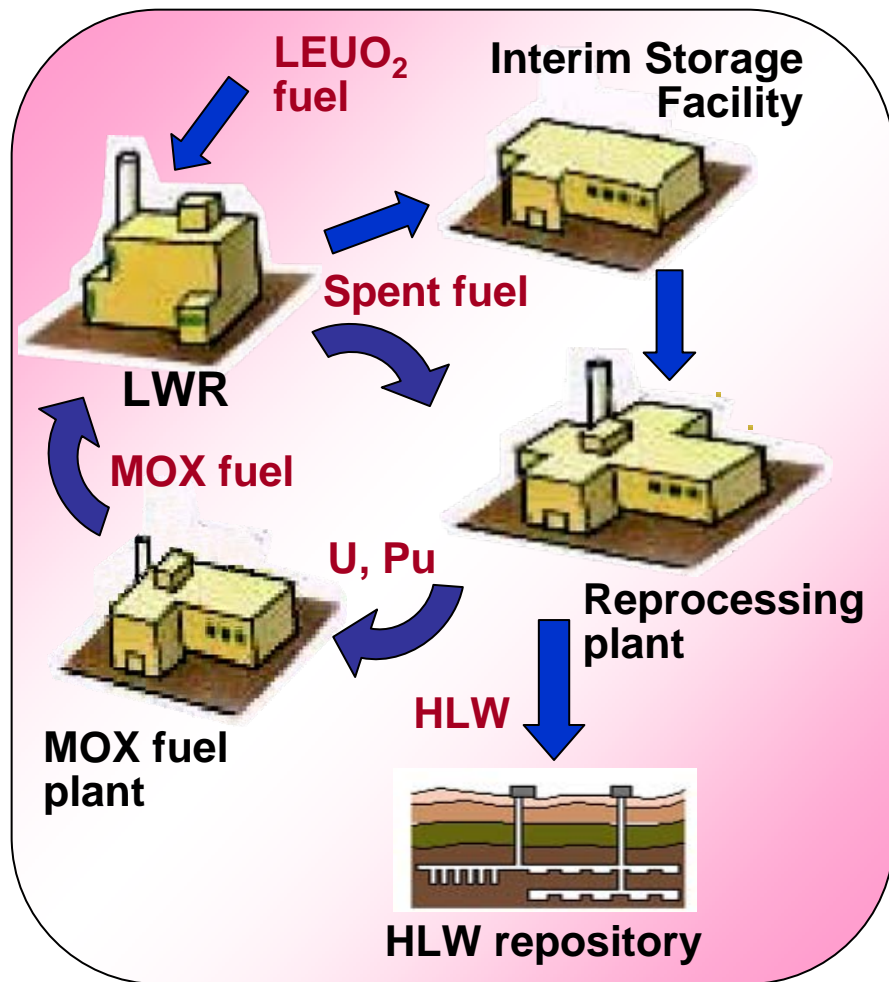
Plant operation has been suspended since December 1995

System start-up test is expected to start in October 2008.



April 1988: Start of the operation

Japan's Fundamental Strategy for Nuclear Fuel Cycle

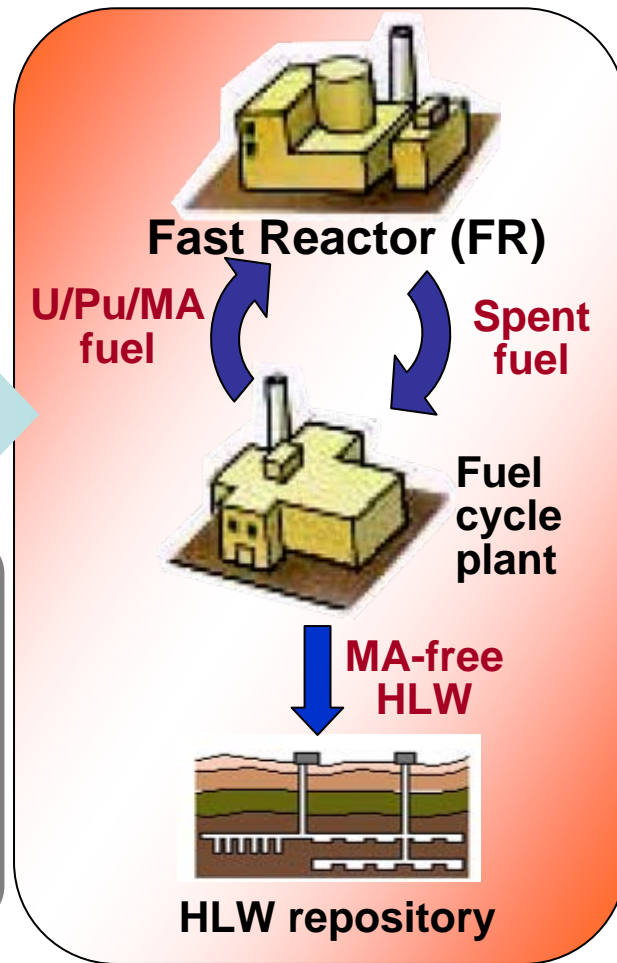


Current LWR fuel cycle

R&D

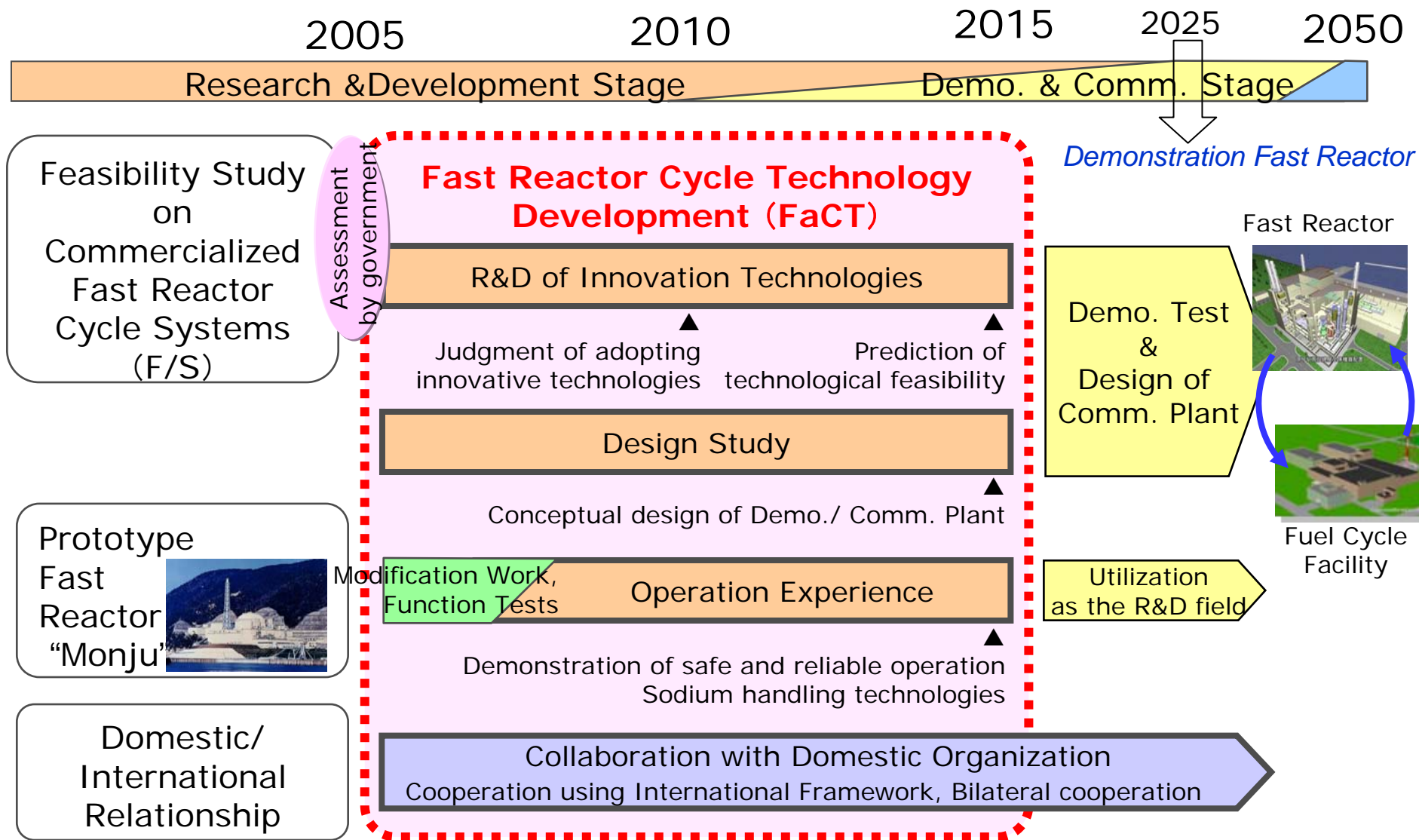
**Industrial and social
Infra-
structure**

**Technical
expertise**

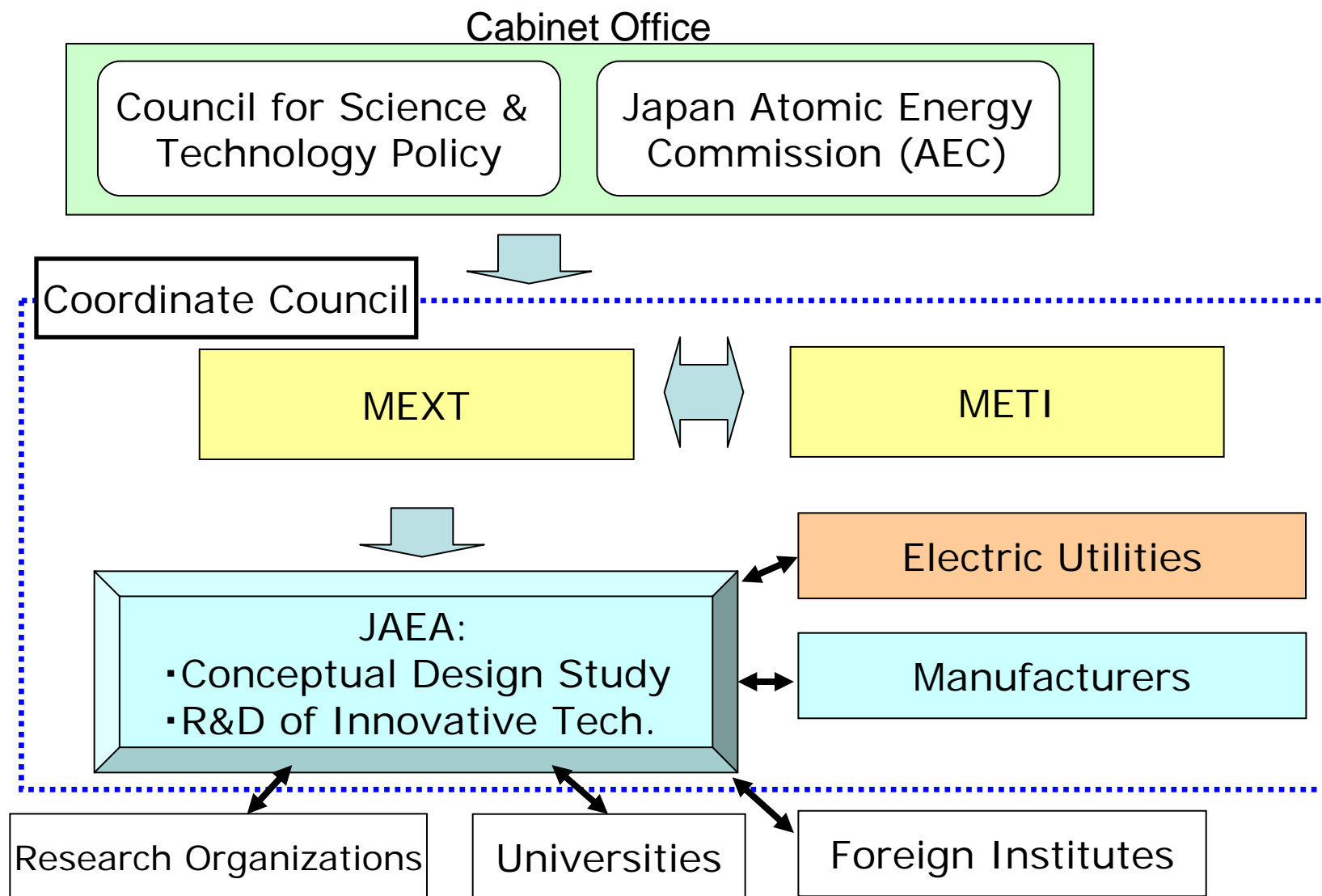


Future FR fuel cycle

Fast Reactor Cycle Technology Development Plan



FaCT-Project Governance Structure



- ***Safety***
- ***Economic Competitiveness***
- ***Reduction of Environmental Burden***
- ***Efficient Utilization of Nuclear Fuel Resources***
- ***Enhancement of Nuclear Non-Proliferation***

Nuclear proliferation resistance is one of the most important features for the consideration for the future FR Cycle system.

III Japan's Efforts to Ensure Compatibility between Peaceful Nuclear Energy Use and Nuclear Non-Proliferation

How has Japan Achieved International Credibility for Non-Proliferation in its Nuclear Fuel Cycle

Five Factors for International Confidence

1. Manifesto for Peaceful Use of nuclear energy
2. Obvious Need for nuclear fuel cycle program
3. Transparency of national nuclear energy program
4. Excellent Record of Compliance with non-proliferation norms for more than 30 years
5. Proactive Contribution to Non-Proliferation



Excellent Record of Compliance with Non-Proliferation Norms

Full Compliance with IAEA Safeguards

- Ratified NPT in 1976
- Signed Comprehensive Safeguards Agreement in 1977
 - Excellent record of compliance with Comprehensive Safeguards since 1977
- Ratified Additional Protocol in 1999
 - Japan has fully implemented AP since then.

◆ Reactors:

55 LWRs, 22 RRCAs, 1 ATR, 1 FBR

◆ Nuclear fuel cycle facilities:

- 2 Enrichment plants
- 4 LEU Fuel Fabrication plants
- 3 Reprocessing plants
- 2 Pu fuel fabrication facilities

Abbreviations:

PDIs: person-days of inspection;
LWRs: Light Water Reactors;
FBR: Fast Breeder Reactor;
ATR: Advanced Thermal Reactor;
RRCAs: research reactors and critical assemblies;

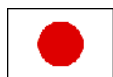
◆ Routine inspection efforts per year:

Approximately 3,000 PDIs (person-days of inspection) for 2006

Excellent Record of Compliance with Non-Proliferation Norms

**<Active contribution to the consideration on the
safeguards application to the commercial nuclear
fuel cycle facilities>**

✓ **Hexapartite Safeguards Project for Centrifuge
enrichment plant (1980~1983)**



✓ **Large Scale Reprocessing Plant Safeguards
(LASCAR) (1988~1992)**



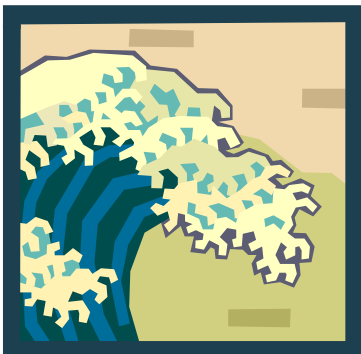
Introductory Statement of the Director General of IAEA at Board of Governors (14 June 2004)



“I am pleased to note that the Secretariat was recently able to reach all conclusions needed for the implementation of integrated safeguards in Japan – the State with the largest nuclear programme subject to Agency safeguards.”

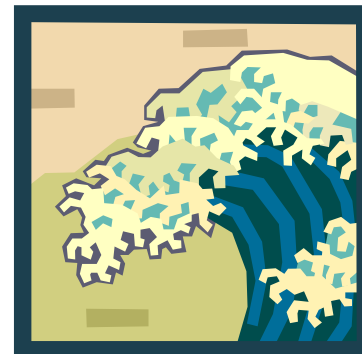
IV Responsibilities of States which pursue Nuclear Energy Option and Japan's Contribution

Two Major Nuclear Trends



Increased Concern about Nuclear Proliferation

- ✓ Nuclear black market
- ✓ Iran, DPRK
- ✓ Nuclear Terrorism

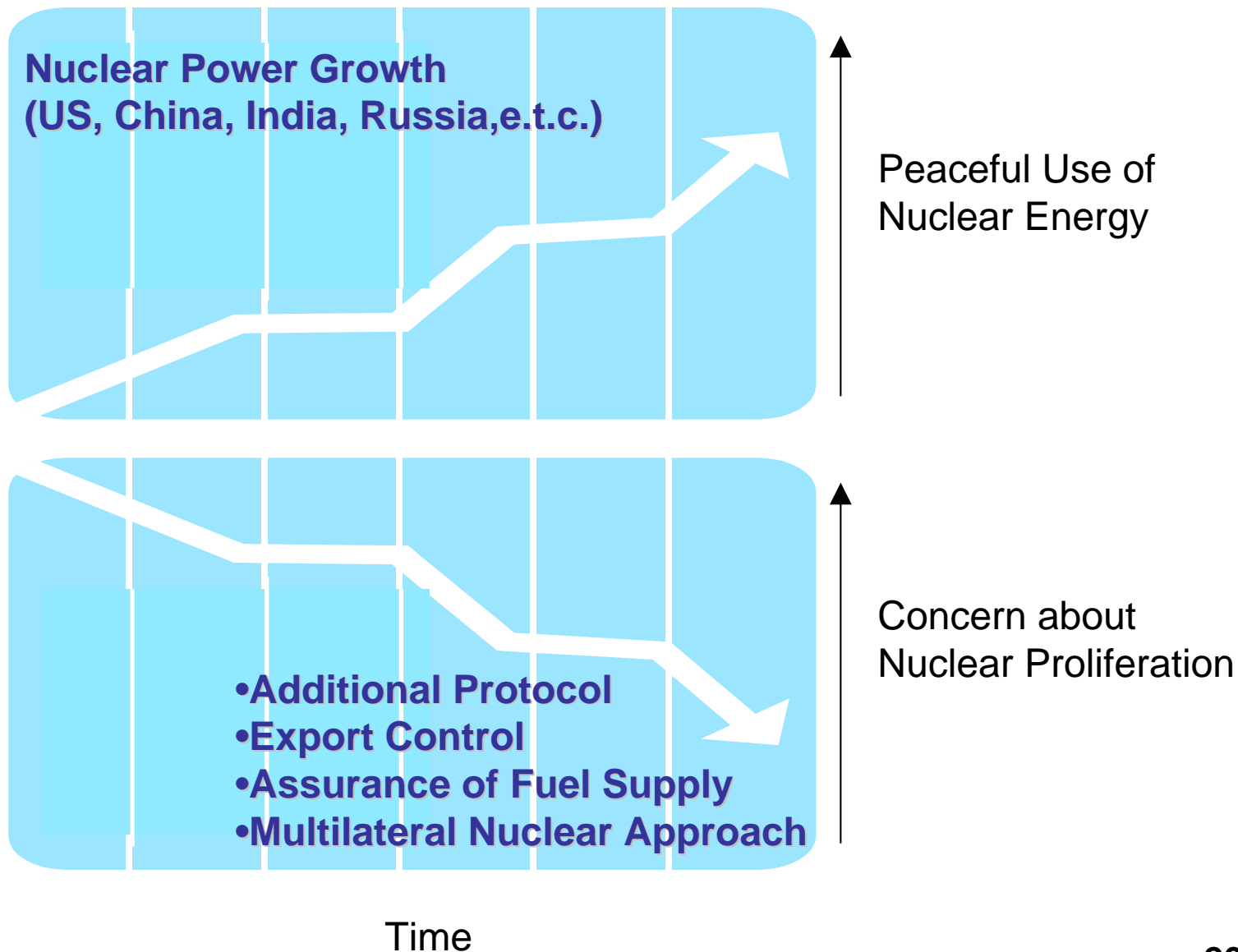


Expansion of Peaceful Use of Nuclear Energy

- ✓ Worldwide recognition of nuclear energy's role

➤ To help sever the link between the two trends

De-linkage of Two Trends





Total Elimination of Nuclear Weapons and Peaceful Use of Nuclear Energy

Importance of dual pursuit of two objectives

**Total Elimination
of Nuclear Weapons**

Nuclear Disarmament

Nuclear Non-Proliferation

Peaceful Use of Nuclear Energy

Towards Total Elimination of Nuclear Weapons

Regime beyond NPT (at present)

NPT is not panacea, and needs to be supplemented by additional measures.

**Nuclear
Non-Proliferation**

Nuclear Disarmament

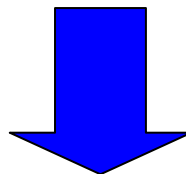
PSI

UNSC1540

NSG

CTBT

FMCT



Further New Regime (in the future)

ex. Multilateral Nuclear Approach, Assurance of Fuel Supply.....



Responsibilities of States which pursue Nuclear Energy Option (1/2)

■ 3S

- Safeguards (safeguards, nuclear non-proliferation)
 - ✓ Comprehensive Safeguards Agreement
 - ✓ Additional Protocol
- Safety (nuclear safety)
 - ✓ Regulatory framework, measures to strengthen earthquake-resistance
- Security (physical protection, nuclear security)
 - ✓ Countermeasures against nuclear terrorism



Responsibilities of States which pursue Nuclear Energy Option (2/2)

- **Development of proliferation resistant nuclear technology**
- **Management of spent fuel and radioactive waste disposal**
- **Human resource development**
- **Nuclear liability**

Nuclear Proliferation-Resistance

- Importance of development of proliferation resistant nuclear technology for future nuclear fuel cycle
 - ✓ Nuclear Material
 - ✓ Process
 - ✓ Facility

- Definition of proliferation-resistance
 - ✓ Intrinsic
 - ✓ Extrinsic

- International discussion on evaluation methodology of proliferation resistance
 - ✓ Gen.IV PRPP WG
 - ✓ IAEA INPRO



Establishment of the international standards for proliferation resistant technology and its evaluation methodology is quite important.

Japan's Contribution to the Issues

➤ Potential items Japan could provide

- ✓ Experience accumulated through the long years of operation of light-water reactors
- ✓ Human resources
- ✓ Advanced light-water reactors
- ✓ Expertise for the creation of a regulatory framework necessary for the introduction of nuclear power
- ✓ Expertise obtained through the acceptance of safeguards and application of the measures of physical protection
 - Development for advanced safeguards technologies for future nuclear fuel cycle
- ✓ Proliferation-resistant nuclear technology

Scientific Matters and Paper Submission

Mr. Julian Whichello
Workshop Scientific Secretary
Department of Safeguards
Division of Technical Support
International Atomic Energy Agency (IAEA)
Tel: + 43 1 2600 21867
Fax: + 43 1 2600 29317
Email: j.whichello@iaea.org

Mr. Ryoji Aso
Nuclear Non-proliferation Science & Technology
Center (NPSTC)
Japan Atomic Energy Agency (JAEA)
Tel: + 81-29-284-3490
FAX: + 81-29-284-3678
E-mail: npstc2007ws@jaea.go.jp

Participation and Administrative Matters

Ms. Takiko SANO
International Atomic Energy Agency (IAEA)
Department of Safeguards
Division of Technical Support
Tel: + 43 1 2600 21991
Fax: + 43 1 26007-21991
Email: t.sano@iaea.org

Ms. Fumiyo Tanaka
Nuclear Non-proliferation Science & Technology
Center (NPSTC)
Japan Atomic Energy Agency (JAEA)
Tel: + 81-29-284-3490
FAX: + 81-29-284-3678
E-mail: npstc2007ws@jaea.go.jp
(For Japanese participants only)

Time table

13 November Participant registration Opening
addresses Special announcements
Invited papers Presentations
14 November Presentations Reception
15 November Final session Official Closing
16 November Optional ½ day tour to:
CLEAR Clean Laboratory for Environmental
Analysis and Research
J-PARC Japan Proton Accelerator Research
Complex



IAEA

Atoms for Peace - The First Half Century
1957 - 2007

**JAEA-IAEA Workshop
on Advanced
Safeguards Technology
for the
Future Nuclear Fuel Cycle**
13 – 16 November 2007
Techno Community Square Ricotti
Tokai-mura • Ibaraki • Japan

Japan Atomic Energy Agency (JAEA)
in cooperation with
International Atomic Energy Agency (IAEA)

V. Concluding Remarks

- **Expansion of peaceful use of nuclear energy is inevitable and desirable from the viewpoint of energy security and global warming.**
- **Peaceful use of nuclear energy should be accompanied by responsibility of states which pursue this option, especially, in the area of nuclear non-proliferation, thus we can de-link expansion of peaceful use of nuclear energy and nuclear proliferation concerns.**
- **Japan has a big stake in the global expansion of nuclear energy, and Japan is willing to provide technical expertise to ensure compatibility of peaceful use of nuclear energy with nuclear non-proliferation**



Thank you for your kind attention